URINE EXAMINATION MADE EASY

CARRUTHERS

SECOND EDITION

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URINE EXAMINATION MADE EASY

A PLAN OF EXAMINATION WITH THE COMMON TESTS FULLY DESCRIBED

BY

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Second Edition

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PREFACE TO SECOND EDITION

In revising this little book for a Second Edition I trust I have made the plan of examination clearer. There are practically no other emendations except to make the text appear less in the form of bare notes; and in this connection the misapprehension of a few leads me to remark that the "notes" were not notes of lectures—teaching of this subject being, of course, by demonstration and not by lecture—but were stylograph notes given to the Nurses with the idea that a Nurse might have something to refer to in remembering details.

T. C.

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PREFACE

This little book comprises notes I prepared in connection with the teaching of Urine Examination to the Nurses here. Though intended primarily for the use of Nurses, it may possibly be of service to others.

For many of the facts I am indebted to the chapter on Urine in Dr. Finlayson's "Clinical Manual," and (when a student in his Clinique) to the able exposition of the subject by his assistants, Drs. R. S. Thomson and John Love.

Blank leaves have been inserted among the "Tests" for notes of further Tests, &c., which may be required.

T. C.

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WHAT IS URINE?

URINE is the name given to **an excretion of the body** expelled by the Bladder through the Urethra.

SOURCE

Extracted from the Blood by the Kidneys, urine is **a secretion of the Kidneys**, and reaches the Bladder through the Ureters.

COMPOSITION

Urine consists of **water with substances** in the water [chiefly Urea (the waste nitrogen of the body), Sodium Chloride (common salt), and a colouring-matter which goes by the name of Urobilin]. All the substances may be **dissolved** in the water or some of them may **not.** They vary in their **amounts.** Again, some may be **present** which should be absent, and some **absent** which should be present. The **proportion** between water and substances also varies.

The **detection** of what substances are present or not in urine and the total proportion of the *dissolved* substances to the water (the "specific gravity" or "concentration" or "dilution") is called Qualitative Analysis; the calculation or **estimation** of the total quantity of substances and the quantity of each is called Quantitative Analysis.

In order to find out the composition of—analyse—examine—any urine **a sample or specimen** is taken, either from what is passed *at the time*, or from a mixture of what is passed in *twenty-four hours*. The latter gives more reliable results.

SECTION A

HOW TO PREPARE A SPECIMEN

A nurse must know how to *prepare* a specimen of urine, whether she know how to *examine* it or not.

A specimen of a patient's urine must be a specimen of that patient's urine, and not a specimen of something else or somebody else's. Accordingly, **contamination must be avoided** and **specimens must be identified.**

Decomposition *alters* a specimen. This occurs more readily in dirty vessels, with exposure to the air, and with keeping in a warm place. Consequently, **if a specimen is to be kept**, it must be prepared *for keeping.*

In females a "**catheter specimen**" is frequently ordered, to avoid contamination with discharges.

A specimen of the *early morning* urine is that **usually** prepared.

METHOD

USING ONLY VESSELS SCRUPULOUSLY CLEAN

I. FILL THE URINE-GLASS TO WITHIN A COUPLE OF INCHES OF TOP.

II. NOTICE WHETHER THE SPECIMEN IS CLEAR OR TURBID.

III. LABEL IT WITH NAME OF PATIENT, WARD, DATE.

IV. TAKE THE "REACTION" (PAGE 15).

V. PLACE A PLUG OF COTTON-WOOL IN THE MOUTH OF THE URINE-GLASS.

VI. KEEP THE SPECIMEN IN A COOL PLACE.

To learn the method, practise with many specimens

SECTION B

HOW TO EXAMINE THE SPECIMEN

A specimen of urine is a fluid. It is a fluid with substances in it, all of which may be *dissolved* (clear), or some may not and be *suspended* (turbid) or *settle* to the bottom (sediment). It is also a fluid with *smell*, *colour*, *weight*, with what is called a "*Reaction*"; gives a *response to heat and chemicals* by means of what are called "*Tests*," and can be examined by the microscope. These, then, are **its characters** or features, *qualities* or properties.

1. Specific Gravity.*

2. Reaction.†

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* "Gravity" means weight. "Specific" means special or particular or standard. Specific Gravity therefore means Standard Weight. The specific gravity of urine means its weight *compared* with a Standard (the Weight of an Equal Quantity of Pure Water—represented by "1" or "1000"), just as the specific length of a beam is its length *compared* with a Standard (The Yard).

† Things which turn blue litmus-paper *red* are called "*Acids.*" Things which turn red litmus-paper *blue* are called "*Alkalies.*" Things which do *neither* are called "*Neutrals.*" For example: dip blue litmus-paper into *Spirit of Salt.* Paper turns red. It is therefore an Acid; in fact, its chemical name is Hydro-

3. **Odour.**
4. **Appearance**—the *naked-eye* or *macroscopic* appearance (colour, translucency, sediment).
5. **Response to Heat and Chemicals.**

[6. Appearance under the Microscope—the *microscopic* appearance.]

The characters of a specimen can be described, *e.g.*, its colour is blue," or "it responds to the Test for," let us say, Sugar—which, be it noted, does not *necessarily* imply that the specimen "contains" Sugar: that requires consideration and may need confirmation. Now it is *by investi-*

chloric Acid. Again, dip red litmus-paper into a solution of *Washing Soda.* Paper turns blue. It is therefore an Alkali. Again, dip either kind of litmus paper into a solution of *Common Salt.* Neither paper turns colour. It is therefore a Neutral (neither; neuter). Now, if anything contain an Acid or an Alkali, the Acid or the Alkali will act on litmus-paper. If it contain neither, then there is nothing to act on litmus-paper. THIS ACTION ON LITMUS-PAPER is called the "REACTION." [Mixing an Acid and an Alkali in proper proportion produces a Neutral: *e.g.*, mix Spirit of Salt with Washing Soda and Common Salt is produced. An Acid and an Alkali are therefore said to "neutralise" (counteract) each other. Try the experiment by putting one or two small pieces of Washing Soda into a bowl with a little water, and then adding some Spirit of Salt (Hydrochloric Acid). Stir occasionally. *Immediately* the bubbles (of Carbonic Acid *Gas*) cease to come off, take the Reaction with both kinds of litmus-paper and taste the water. Things begotten of such a union are called in Chemistry "Salts" (but are *not always* Neutrals).]

gating and describing its characters that the composition of a specimen becomes known and *ultimately* whether the urine is "normal" (natural; according to a standard) or is not normal ("abnormal"), and what is required of a nurse in examining a specimen is **a faithful description of the (five) characters** by the use of the senses, instruments, or chemicals mechanically applied. What, in short, is required of a nurse is **careful observation and accurate description.**

Without method in examining a specimen some character is easily forgotten. Failure to investigate a character means that the composition of the specimen is imperfectly known—the examination is *incomplete* and may prove a source of error. Accordingly, to ensure *complete* examination **a method must be followed.**

METHOD

I. NOTICE THAT THE SPECIMEN PRESENTS CERTAIN CHARACTERS FOR DESCRIPTION.

II. PROCEED TO INVESTIGATE AND DESCRIBE EACH CHARACTER IN ORDER.*

1 DESCRIBE THE SPECIFIC GRAVITY.

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* The description of each character should be written down, and when the examination is finished transferred to the Urine Journal. (*See Specimen Page for Urine Journal*, p. 19.)

USING THE URINOMETER

Don't lift the Urinometer out of a specimen and put it straightway into another, else one will contaminate the other. Wash it.

Don't take the Specific Gravity till the specimen has cooled.

If the Urinometer is **found to be touching the bottom** of the urine-glass, *lay aside* the specimen for the doctor.

PROCEDURE

Lower the Urinometer into the specimen and allow it to settle *quite free* of the sides of the urine-glass. The level of the surface of the urine gives the number. Read the number from below* the surface. If the number is, say, 20, then the Specific Gravity is

10*20*†

Is it *1030 or more?* suggests *Sugar* (Test IV.).
Is it *1010 or less?* suggests *Albumen* (Test I.).
Is it *1015 to 1025?* suggests—*see Note, p.* 40.

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* It will be noticed there is *a drop running up the stem.* The level of this drop might be taken as the true level if the number were read from above. With a turbid specimen remember this fact.

† When the urinometer is in water it is seen to float at number 0. Urine being denser than water, the urinometer does not sink so far. The one number is compared with the other—*e.g.*, 0 is compared with, say, 20, which is the very same as comparing 1000 and 1020; and the latter comparison is the one usually adopted.

2. DESCRIBE THE REACTION.

USING THE LITMUS PAPER

Take the blue paper first (as urine is commonly acid) and dip it into the specimen. If it **turns red**, the reaction is said to be

Acid.

[Is it *acid ?* Section C.
Is it *unduly acid ?* Section D.]

If it does not, dip the red paper in. If it **turns blue**, then the reaction is said to be

Alkaline.

[Is it *alkaline ?* Section C.–Section D.]

If the specimen gives **neither** reaction, the reaction is said to be

Neutral.

Occasionally a specimen gives **both** reactions (*amphoteric* reaction). This may happen when decomposition is beginning.

3. DESCRIBE THE ODOUR.

[Is it "*urinous*" ? Section C.
Is it *of Ammonia*, &c. ? Section D.]

4. DESCRIBE THE APPEARANCE.

PROCEDURE

1. Describe the **Colour.**

Is it *pink?* suggests *Blood* in small quantity (Test II.).

Is it *pale-red to chocolate?* suggests *Blood* in larger quantity (Test II.).

Is it *greenish?* suggests *Pus.*

Is it *yellow-brown against the light, a greenish tinge away from the light, greenish at upper margin?* suggests *Bile* in moderate quantity (Test V.).

Is it *deep brown?* may mean *Bile* in larger quantity.

[Is it *pale yellow to brown-yellow?* Section C.]

[Is it ——— ? Section D.]

2. Describe the **Translucency**—*i.e.*, whether **clear or turbid.**

Is it *turbid?* Suggests *Mucus*, *Urates*, *Phosphates*, *Pus*, or *Blood*, &c.

Mucus—Known to practised eye.

Urates—Appeared on cooling, urine acid.

Phosphates—Present when passed, urine alkaline (neutral).

Pus—Present when passed, urine acid or alkaline.

Blood—Peculiar opalescence (called "smoky") with a small quantity.

Proof under Test I.

May mean Decomposition—Bluish scum on surface, odour of ammonia, urine alkaline and standing for a time.

May mean Contamination—Peculiar, *e.g.*, cotton-wool like mucus.

[Is it *clear?* Section C.]

3. Describe any **Sediment.**

Suggests *Mucus*, *Urates*, *Phosphates*, *Pus*, *Blood*, &c.

Mucus—Known to practised eye.
Urates—Fawn-coloured, pink, or red; often in children white.
Phosphates—White.
Pus—White, or creamy, or greenish.
Blood—Red, or brownish, or chocolate.

Proof in Tests

May mean Contamination—*e.g.*, cotton-wool like mucus.

5. DESCRIBE THE RESPONSE TO HEAT AND CHEMICALS.

USING CERTAIN TESTS

The application of heat and chemicals implies Chemistry, and Chemistry is exact and exacting, allowing of no slipshod ways, so that **the directions given must be followed faithfully.** If not, the Tests will give wrong results, just as surely as a mistake in adding figures gives a wrong result.

What Tests should be applied depends, under ordinary circumstances, upon what may have been suggested in describing the other characters, but **Test I. must always be applied.**

TEST I.

A. Using both Heat and Chemicals (Acetic Acid).

Pay particular attention to the Reaction and any Turbidity.

Observe that some of the **Turbidities** already noted can now be **definitely distinguished** from each other.

PROCEDURE

Fill a test-tube about full of the urine and hold it by the bottom.

1. Heat *gently* the *upper part* * of the urine (not test-tube). If the urine is turbid and becomes *clear* or *less turbid,* see p. 22, *a.*

2. Continue heating till the urine is quite "through the boil," when either *a cloudiness* or *no cloudiness* will have appeared in the boiled part.

(A) What to do when a cloudiness has appeared.

Add one drop or two drops † of the *Dilute* Acetic Acid.

If the cloudiness *disappears,* see p. 22, *b*; **and finish the Test** by way of (B), as if no cloudiness had appeared.

If the cloudiness *remains,* the specimen

Responds to the (Heat) Test for Albumen.

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* Testing the upper part only, allows of *contrast* with the untested lower part.

† *Method of dropping.* (This must be learnt, as *drops only* are to be used.) With one hand slightly raise the stopper. Grasp bottle in the other hand, and place its forefinger on top corner of stopper. Press so as to tilt stopper against neck of bottle. Solution will now come out in drops.

SPECIMEN PAGE FOR URINE JOURNAL ($\frac{1}{2}$ ACTUAL SIZE)

Name..

Age..........................

Date		Quantity		Specific Gravity	Reaction	Odour	Appearance			Responds to Test for					&c.
19		Day	Nigh				Colour	Turbidity	Sediment	Alb.	Blood	Pus	Sugar	Bile	

(B) What to do when no Cloudiness has appeared.

Hold the test-tube against a *dark background* to make sure that *a cloudiness has really not appeared.*

If the urine is *turbid*, a cloudiness may have appeared as *an addition to* the Turbidity.

If there is much *turbidity* it may be *obscuring a cloudiness*, and then some urine will require to be taken from the urine-glass and *filtered*, and the Test begun over again.

(*a*) If the reaction of the specimen **was acid**, it can be declared to give

No Response to the (Heat) Test for Albumen.

If *very acid*, refer to doctor.

(*b*) If **alkaline or neutral** it cannot. It *must be tested further*.

(1) Add a drop of the *Dilute* Acetic Acid and boil again. If no cloudiness appear,

(2) Add a drop or two drops more and boil again.

If no cloudiness appear, the specimen can *now* be declared to give

No Response to the (Heat) Test for Albumen.

If *very alkaline*, refer to doctor.

Note.—Convenient terms for *describing the degree of cloudiness on boiling which persists:* "*trace*" (T.), meaning the least possible; "*faint haze*" (F.H.), "*haze*" (H.), cloudiness still transparent; "*cloud*" (C.), "*dense cloud*" (D.C.), "*very dense cloud*" (V.D.C.), transparency lost; and lastly comes "*solidification*" (S.). N.B.—Do not use the term "*deposit*" here. A deposit means rather something which settles to the bottom (p. 26).

IN A TURBID SPECIMEN:

a. If the Turbidity *disappears wholly or partly on gentle heating*, the specimen

contains Urates.

b. If the Turbidity or the Cloudiness on boiling or both together *disappear on adding the Dilute Acetic Acid* the specimen

contains Phosphates.

c. If the Turbidity (*not Cloudiness on boiling*) *remains on adding the Dilute Acetic Acid* it may mean *Mucus* or *Blood* or *Pus*, &c.

To see if it be Pus,

Apply Test III. (p. 29) to the *sediment* in the *urine-glass*. [If no sediment, doctor will employ microscope.]

If it is not, then

To see if it be Blood,

Apply Test II. (p. 26).

If it is not, then,

To see if it be Mucus,

Add Liquor Potassæ, when it will disappear.

If it is not, then it may be a *Contamination*, &c. [Doctor will employ microscope.]

B. USING CHEMICALS (Nitric Acid) WITHOUT HEAT

PROCEDURE

1. Pour a little of the strong Nitric Acid into a test-tube. Then hold the test-tube *almost horizontal* with one hand and take the urine-glass in the other. *Place* the little beak of the urine-glass within the mouth of the test-tube.

2. *Now tilt the urine-glass* till the urine begins to *trickle* down the side of the test-tube. This urine will accumulate on top of the Nitric Acid. When a sufficient quantity has accumulated, remove the urine-glass.

3. Now bring the test-tube *very slowly* into the vertical position.

If **a white ring** is seen **at the JUNCTION** of the two fluids the specimen

Responds to the (Cold) Test for Albumen.

Wait five minutes, and, if necessary, **reverse the procedure** by putting the urine first into the test-tube, and then letting the Nitric Acid trickle down to the bottom, before declaring that the specimen gives

No Response to the (Cold) Test for Albumen.

ROUGH METHOD OF ESTIMATING ALBUMEN AND COMPARING ONE DAY WITH ANOTHER

Fill a test-tube half full of the urine and boil it *all thoroughly*. If the urine is **alkaline or neutral**, add the *Dilute* Acetic Acid, *drop after drop*, mixing, and dipping in blue Litmus-paper *until* it is found to turn red. Then *boil again.*

Allow the test-tube to stand upright *for twenty-four hours*. **The proportion** of Albumen can then be seen (as a *third*, a *fourth*, a *sixth*, and so on), and one day compared with another.

TEST II.

USING THE TINCTURE OF GUAIACUM AND THE OZONIC ETHER

Unless the pipette is used and the "reagents" are *fresh*, **the presence of Blood** may be missed. That the Ozonic Ether may be fresh, the bottle should be well-stoppered, and should be small, so as to need frequent renewal.

PROCEDURE

*With the pipette** take some urine from the *bottom* of the urine-glass and put it into a test-tube. Add *one or two* drops of the Tr. Guaiac. Shake up. Then add a little of the Ozonic Ether. The Mixture clears, or the Ether comes to float on top.

Hold the test-tube against a *white background*.

If a **bluish** *colour* is seen in the Ether the specimen

Responds to the (Guaiac) Test for Blood.

The colour disappears on standing.

TEST III.

USING THE LIQUOR POTASSÆ

When the amount of Pus is small, this test is not very satisfactory. [Doctor will employ microscope.]

PROCEDURE

With the pipette * take up some of the *sediment* from the *bottom* of the urine-glass. Put it in a test-tube. Add an equal quantity of the Liquor Potassæ.

---

* *Method of using the pipette.* Put forefinger on top. Now put pipette to bottom of urine-glass. Now lift forefinger. Some urine runs up. Replace forefinger. Now lift pipette out. Put pipette into test-tube. Now lift forefinger. Urine runs out. Replace forefinger. Remove pipette. *Practise* the method.

If the mixture is **gelatinous**, the specimen

Responds to the (Liq. Potassae) Test for Pus.

To show this: Pour it gently from the test-tube. It comes out in long *threads* ("ropy") or in *drops with long tails.*

Summary Regarding Turbidities and Sediments

	Appearance	Reaction of Urine	Response to Heat and Chemicals
Mucus	Turbidity or Sediment known by practised eye		*Not* dissolved by Heat—Dissolved by Liq. Potass.
Urates	Turbidity after cooling — Fawn-coloured, pink, or red Sediment (white often in children)	Acid	*Readily* dissolved by Heat — Dissolved by *dilute* Liq. Potass.
Phosphates	Turbidity on passing — White Sediment	Alkaline (neutral)	*Not* dissolved by Heat (sometimes increased)—*Readily* dissolved by dilute Acetic Acid.
Pus	Turbidity on passing — White, creamy, or greenish Sediment	If Alkaline, Sediment gelatinous	*Not* dissolved by Heat—Test III.
Blood	Peculiar pink Opalescence ("smoky") with small quantity—Red, brownish or chocolate Sediment, with larger quantity		*Not* dissolved by Heat—Test II.

TEST IV.

Using the Fehling's Solution

Fehling's Solution readily goes wrong. In order to make it up fresh at any time, two bottles are usually kept. They are well-stoppered and one is *labelled* "*No.* 1" and the other "*No.* 2." *Equal* parts from each bottle are used.

If the urine contains **more than a trace of Albumen**, boil it in a test-tube as described on page 26. Then *get rid of the Albumen* by filtering. **Use this urine** for the test.

Avoid much boiling while testing.

Procedure

Put an inch deep of "Solution No. 1" into a test-tube. Make it up another inch with "Solution No. 2."

Boil this Solution. If it is all right, *colour does not change.*

Add the urine *drop by drop.*

If a **brick-red or yellowish precipitate** appears the specimen

Responds to (Fehling's) Test for Sugar.

If no precipitate appear, go on adding drop by drop till the urine added is *nearly equal to*—on *no account more than*—the solution.

Boil the mixture and allow it to cool before declaring that the specimen gives

No Response to (Fehling's) Test for Sugar.

READY METHOD OF ESTIMATING SUGAR AND COMPARING ONE DAY WITH ANOTHER

USING PAYNE'S REAGENT

Follow the Directions *carefully*. Rinse the Dropper when finished.

TEST V.

USING NITRIC ACID

PROCEDURE A

Near each other on a white plate, place some *fuming* Nitric Acid and some of the Urine. Allow them to run into each other.

If a **play of colours** *ending* in a dirty yellow-*green* results, the specimen

Responds to (Gmelin's) Test for Bile.

PROCEDURE B

Pour a little of the strong Nitric Acid into a test-tube. *Trickle* some urine down the side of the test-tube on to the top of it (p. 25). Bring the test-tube slowly to the vertical position.

If a **green colour** is seen at the junction of the two fluids the specimen

Responds to (Gmelin's) Test for Bile.

If the urine is rather dark, the colour will be better seen if either the Nitric Acid or the urine is first diluted with water. (Refer to doctor.)

HOW TO BECOME PROFICIENT IN THE EXAMINATION OF A SPECIMEN

To attain proficiency in the examination of a specimen requires much and continuous practice. Section B provides, as it were (like other sections), rules for practice.

The way to become acquainted with rules is to apply them to practice. Hence *the way to use Section B* and become acquainted with it is to apply it to practice. Thus: a patient's urine having been collected and a specimen prepared, refer to Section B and follow the directions *carefully*. Repeated and careful reference to rules begets such familiarity with them that they are followed both rapidly and accurately; ultimately reference to them becomes unnecessary. Hence examine as many specimens as possible.

METHOD

1. **Take a specimen and examine it by careful reference to Section B.**
2. **Examine as many specimens as possible in the same way.**

This may be rather tiresome at first, but a **nurse must proceed thus** if she hopes to become proficient in the examination of a specimen and be of service to the doctor, and not, as might easily happen, worse than useless. Moreover, she may take it as an incentive that she is at the same time acquiring a good habit—a habit of method and observation so invaluable in a nurse.

SECTION C

IS THE URINE NORMAL?

The natural look of urine being a matter of common knowledge, a nurse may say that urine *looks* normal, but urine is not normal because it happens to look normal. Urine is normal when *all* its characters are normal. And when is a character normal? A character is normal when it has been properly investigated and the *meaning* of the description has been *proved* to be normal.

To find out and prove what her description of a character means is more than is expected of a nurse. However, provided she is sound in procedure and careful in observation, she may (for convenience in certain circumstances, such as brevity on Charts, &c.) be allowed to describe urine *as* normal or otherwise. Nevertheless, she

must always keep a description of all the characters for reference, if need be, by the doctor.

HOW TO DECIDE

AFTER DESCRIBING ALL THE CHARACTERS OF THE SPECIMEN, COMPARE THE URINE WITH NORMAL URINE.

IF THE DESCRIPTION OF EVERY CHARACTER IS THE SAME AS IN NORMAL URINE, THE URINE IS NORMAL.

IF THE DESCRIPTION OF ANY CHARACTER IS NOT THE SAME AS IN NORMAL URINE, THE URINE IS ABNORMAL.

With a little **practice** what is a normal description of a character comes to be readily recognised, so that urine can soon be described as Normal or Abnormal.

NORMAL URINE

A SPECIMEN EXAMINED

In Normal Urine the substances are *completely* dissolved in the water, so that a specimen of it ought to be **quite clear**. There is, however, some **mucus** collected on the way down the urinary passages, which may not be dissolved, so that there is a certain degree of turbidity from this cause. **On standing** for a little all the mucus may settle to the bottom, leaving the specimen quite clear above, or some may remain still suspended.

Notice that the characters have been described in the same order as in Section B.

CHARACTER.		DESCRIPTION.	
1. Specific Gravity		**1015 to 1025—see Quantity.***	
2. Reaction		**acid.**	
3. Odour		**peculiar; called "urinous."**	
4. Appearance	Colour	**pale yellow to brown-yellow.**	
	Turbidity	**a little suspended mucus only**	**otherwise clear.**
	Sediment	**a little settled mucus only**	
5. Response to Heat and Chemicals		**no response to Tests in Section B**	
[6. Microscopic Appearance.]			

It will be observed that **some of the descriptions vary a little.** This is because the body is **not a machine,** and **no two persons** are exactly alike. Moreover, **diet and exercise** may alter the urine somewhat at times; *e.g.*, it may be more acid than usual, because perhaps the person has eaten a good deal of butcher-meat; or, again, it may be less acid, neutral, or even alkaline, and have an odour like that of the urine of Herbivora, because the person has, it may be, eaten a good deal of vegetables or fruit. Prolonged muscular exercise, or fasting, makes the urine more acid than usual. The **quantity of mucus** varies a little, and sometimes there is none *to be seen.*

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* When the quantity of urine passed is **large** we expect the urine to be more like water, and so its specific gravity to be nearer that of pure water—*i.e.*, to be **low.** When the quantity is **small,** we expect the opposite—*i.e.*, a **high** specific gravity. When the quantity is about **normal,** we expect the specific gravity to be about **normal.** Conversely, **we expect the quantity to be in keeping with the specific gravity.** When the unexpected happens, there is something peculiar about the urine, and this is just what happens in—*e.g.*, Diabetes mellitus. Hence

Never regard the Description of the Specific Gravity given here as Normal

before considering the Quantity of urine passed. (The most reliable Specific Gravity is that of a specimen of the urine passed in twenty-four hours.)

QUANTITY

The quantity of urine **passed in twenty-four hours in health** *is* the normal quantity, but *how much* that may be depends upon **the person**, and upon **circumstances.**

Stated generally, an **adult** passes

from 2 to 3 pints

(40 to 60 ounces—average 50). In the case of *children*, Ashby and Wright * give the following:

2– 5 years	*about*	15–25 oz.
5– 9	,,	25–35 ,,
9–11	,,	35–40 ,,

(about 1 to 2 pints, according to age).

It may be less than usual, because, *e.g.*, more water than usual is being lost by the skin (as on a hot day); or it may be more than usual, because, *e.g.*, less water than usual is being lost through the skin (as on a cold day).

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* "The Diseases of Children."

When *calculating* the quantity passed in *twenty-four hours*, begin counting from the time the patient emptied Bladder last. When the twenty-four hours are up, ask the patient to empty Bladder and count this in.

"DON'T FORGETS"

1. Don't forget, when the urine is found to be abnormal, to preserve a specimen (not the remains of a test) for inspection and verification by the doctor; and to be ready to produce, if asked for, any medicines the patient may be taking.

2. Don't forget, when preserving such specimen,

(1) The cotton-wool plug,
(2) The label,
(3) To keep it in a cool place.

SECTION D

ABNORMAL URINE—SOME COMMON CAUSES

Urine is *described as abnormal* by simply stating wherein lies the difference from Normal Urine. *Every* point of difference must be stated, because what is *not* stated is *understood* to be normal.

A Specimen Examined		Some Common Causes				
CHARACTER	DESCRIPTION	DRUGS	DISEASE	DECOMPOSITION	CONTAMINATION	DECEPTION
1. Specific Gravity	10· · see Quantity (p. 40)					
2. Reaction	Alkaline	Potash or Soda in sufficient quantity (colour of litmus-paper not restored with gentle heat)	Chronic Cystitis (from *decomposition* in Bladder)	(Colour of litmus-paper restored with gentle heat)		
	Unduly acid	Benzoic acid Boracic acid	Fevers, Gout, Rheumatism	Unusual and peculiar		
3. Odour	Of Ammonia		Chronic Cystitis	Urine standing for a time		
	Of sweet violets.	Turpentine				
	Like whey or like alcohol (on standing)		Diabetes *mellitus*			

A SPECIMEN EXAMINED		SOME COMMON CAUSES				
CHARACTER	DESCRIPTION	DRUGS	DISEASE	DECOMPOSITION	CONTAMINATION	DECEPTION
Colour	**Turning dark green to black on standing**	Carbolic acid				
	Yellow, urine acid; **Carmine,** urine alkaline	Medicinal rhubarb				
	Brown tinge	Senna				
	Black	Creosote, Tar				
	Golden-yellow, urine acid; **Orange-red,** urine alkaline	Santonin				
	Like blood	Logwood (Hæmatoxylon)				
	High		Acute fever			
	Pale		Diabetes			
	Des. in Sec. B. **Of blood**		Acute Nephritis			
	Of bile		Jaundice			
ance.	**Of pus**		Urinary disease			

4. Appear	Turbidity or Sediment		Bluish scum on surface			Urine standing for a time		
		Described in Section B.	Of Mucus in absolute excess		Inflammation of Bladder			
			Of Urates		Stomach or Liver disorder			
			Of Phosphates	Potash or Soda in sufficient quantity	Chronic Cystitis	Urine standing for a time		
			Of Pus urine acid		Kidney disease Cystitis		Purulent discharges	
			urine alkaline		Chronic Cystitis			
			Of Blood	Excess of Cantharides (blisters), of Turpentine, Creosote, Alcohol	Kidney or Bladder disease, Scurvy, Hæmophilia		Bloody discharges	
			Of ——		Chyluria (milky)		*E.g.*, Cotton-wool	
			Of glairy, whitish or yellowish material floating or diffused				Leucorrhœal discharge	

A SPECIMEN EXAMINED		SOME COMMON CAUSES				
CHARACTER	DESCRIPTION	DRUGS	DISEASE	DECOMPOSITION	CONTAMINATION	DECEPTION
5. Response to Heat and Chemicals	**I. Responds to Test for Albumen** (Albuminuria — *when not due to Contamination or Deception*)	Excess of Cantharides, of Turpentine, &c.	Acute Fever, Sequela of Scarlet Fever and occasionally of other fevers, Acute and Chronic Kidney disease, Venous congestion, Prolonged or profuse suppuration often, Many chronic diseases			Bad testing. *Wholly* to be accounted for by amount of, if present, Blood or Pus. Patient taking *Copaiba*
	II. Responds to Test for Blood (Hæmaturia—*when not due to Contamination or Deception*)	*See* 4	*See* 4		*See* 4 Saliva (which may contain blood	Bad testing. Patient taking drugs containing *Iodine*
	III. Responds to Test for Pus (Pyuria —*when not due to Contamination or Deception*		*See* 4		*See* 4	

Response to Heat and Chemicals (*continued*)	**IV. Responds to Test for Sugar**(Glycosuria—*i.e.*, Glucose or Grape-sugar, not Cane-sugar—*when not due to Contamination or Deception*)		Diabetes *mellitus*, Stout persons with gouty tendencies, Cerebral disease, Nervous irritability and dyspepsia, Whooping-cough sometimes			Bad testing. Much boiling while testing. Very concentrated urine. After Chloroform. Patient taking Chloral. (*Fermentation Test* will distinguish)
	V. Responds to Test for Bile		Jaundice			
[6. Microscopic Appearance]						
QUANTITY	**Increased** (Polyuria)	Tea, Caffein, Digitalis, Juniper, &c.	Diabetes, Cirrhosis of Kidney			
	Diminished (Ischuria, oliguria)	Excess of Cantharides, &c.	High Fever, Acute Nephritis, Last stages of Bright's Dis.			

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